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The terrestrial isopod fauna of the Rinya region II. Péterhida1

by
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Abstract: Isopods of a dry oak forest and the surrounding ruderal vegetation were sampled along a line transect by pitfall trapping. The captured species were *Armadillidium vulgare* Latr. (46.16%), *Porcellium collicola* Verh. (33.16 %), *Trachelipus rathkii* Brandt (10.29 %) and *Trachelipus ratzeburgi* Brandt (9.47 %). Difference was not found between the spatial distribution of *A. vulgare* and *P. collicola. T. ratzeburgi* seemed to prefer the inside of the oak forest, whereas individuals of *T. rathkii* were trapped mainly in the ruderal vegetation. The ratio of gravid females of *T. rathkii* was conspicuously higher at the sampled places than that in wetland forest. This phenomenon is probably due to the effect of the less suitable habitat. The seasonal changes of surface activity and sex ratio were also examined.
Keywords: Isopods, *Armadillidium vulgare* Latr., *Porcellium collicola* Verh., *Trachelipus rathkii* Brandt, *Trachelipus ratzeburgi* Brandt, pitfall trapping, spatial distribution, habitat preference, surface activity, sex ratio

Introduction

The systematic ecological research of the isopods living in the regions of the Dráva River and Rinya Stream (Southwest Hungary) began in 1996. One of the 32 sampling sites was located in a lowland oak forest not far from the village of Péterhida. The main questions of the study were: (1) which Isopoda species live here; (2) is there any habitat preference of the male, female and gravid female specimens of the different Isopoda species; and how does (3) the surface activity (4) sex ratio and (5) reproductive characteristics of their populations change in time.

Material and methods

The Danube-Dráva National Park is located in South Transdanubia in Hungary and consists of many islandlike natural reserves. One of them is the oak forest located 2 km south of the village of Péterhida. The sampling site is located at: 46°00'10" North latitude and 17°01'35" East longitude (Fig. 1.)(XL 89 UTM unit) .

The material was collected between 1 May 1996 and 29 November 1996. The traps were checked approximately every 18th day, ten times in all during the sampling period. (The material collected at the first check will be referred to as sample No. 1., the second as No. 2., etc.). The plastic jars used as traps had a diameter of 7 cm and height of 10 cm, and were half filled with 70 % ethyleneglycol.

[1] A Rinya-ártér Isopoda faunája I. Bakháza. (The Isopoda fauna of the Rinya region I. Bakháza)

Fig. 1. The location of the sampling site

Ten pitfall traps were used. All of them were set in a 45-meter-long line transect. The distance between the traps was 5 meters. The transect started inside the oak forest, and perpendicularly crossed the edge, ending in the ruderal vegetation that surrounded the oak wood. The first five traps ("a" – "e") were placed in the vegetation consisting of *Quercus robur* (80%), *Carpinus betulus* (10 %), *Acer campestre, Corylus avellana, Ulmus* sp. (10 % together), understorey*: Circaea lutetiana, Hedera helix, Viola* sp., *Athyrium filix-femina*. The vegetation around traps "f", "g" and "h" consisted of *Quercus robur* (45%), *Carpinus betulus* (15%), *Robinia pseudoacacia* (25%), *Cornus mas, Sambucus nigra, Acer campestre* (15% together), understorey*: Urtica dioica* and *Athyrium filix-femina*). The last two traps ("i" and "j") were surrounded by *Robinia pseudoacacia* (45%), *Sambucus nigra* (55%), understorey: *Urtica dioica, Conium maculatum, Anthriscus cerefolium, Galium aparine*.

The data were standardized to analyse seasonal changes in surface activity by the equation: N/dx tr, where N = number of individuals in one sample, d = number of days between two checkings, and tr = number of traps (some traps were destroyed by animals and these were excluded from the analysis). In order to analyse the habitat preference of the species an index was computed what proportion of the total number of trapped individuals of a species was captured by a given trap. The index was calculated in all of the 10 samples.

Results and discussion

1. Species composition of the sampling area

A total of 1224 individuals were caught during the sampling period. Most of them (565 specimens = 46.16%) were *Armadillidium vulgare* Latreille (1804) and *Porcellium collicola* Verhoeff, 1907 (406 specimens = 33.16 %). Subdominant species were *Trachelipus rathkii* Brandt,1833 (126 specimens = 10.29 %) and *Trachelipus ratzeburgi* Brandt, 1833 (116 specimens = 9.47 %) (Fig. 2.). Eleven female individuals of Trichoniscidae family (6 specimens of *Trichoniscus sp.* and 5 specimens of *Trichoniscoides sp.* = 0.89% together) were trapped also. The globally distributed *A. vulgare* is very common in Hungary. There

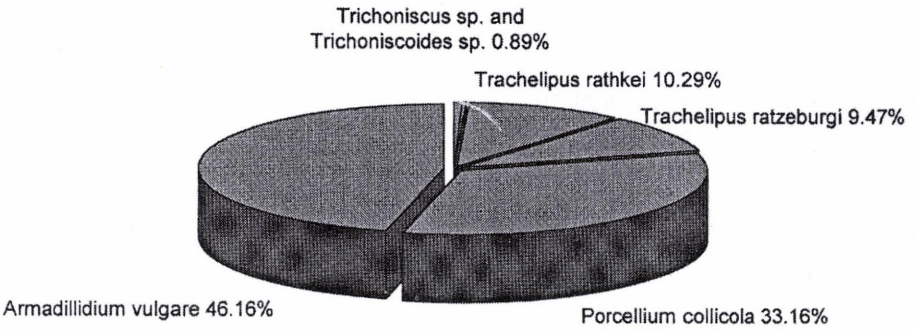

Fig. 2. Taxonomic distribution of the captured species

are more than 50 known localities in this country (Forró & Farkas 1998). *A. vulgare* was observed from all the 32 examined UTM units along the Dráva-Basin (Farkas 1997). *T. rathkii* is the second most abundant Isopoda species in the willow poplar gallery forests along the Dráva. According to other studies *A. vulgare* and *T. rathkii* occur always together in the samples taken from wetland forests of the Dráva, comprising 96% of all the trapped woodlice specimens at Gordisa (Farkas 1998b) and 98% at Mailáthpuszta (Farkas 1995). *T. rathkii* also inhabits Kőszeg Mts (Kesselyák 1937) and in the Bükk Mts (Allspach 1996). Szlávecz (1991) and Loksa (1973) reported it from Újszentmargita. *P. collicola* lives in Central and Southern Europe (Schmallfuss 1985). This species is widely distributed in Hungary. It was noted from many parts of the Hungarian Mountain Range (Allspach 1996, Loksa 1961a, 1966, 1971) from the Kőszeg Mts (Kesselyák 1937) and from the Mecsek Mts (Loksa 1966). Allspach & Szlávecz (1990), later Szlávecz (1995) collected it at Bátorliget. Farkas (1998a, b) reported it from Danube-Dráva National Park. It occurs not only in the mountains, but also on the Great Hungarian Plain (Szlávecz 1991). *T. ratzeburgi* has relatively few distribution data from Hungary. Csiki (1926) and Dudich (1942) mentioned it from Budapest. Loksa (1961b) found it at Vindornyaszőlős. It is known from the Kőszeg Mts (Kesselyák 1937), Mecsek Mts (Gebhardt 1933, 1934, 1960), Bakony Mts (Ilosvay 1983), and from the Dráva-Basin (Lantos 1985, Farkas 1998b).

2. The effect of spatial heterogeneity on the composition of woodlice assemblages

There was no significant difference between the average catch per trap for male and non-gravid female individuals of *A. vulgare* and *P. collicola.* The distribution of gravid females of both species was equal. Traps "a" to "e" caught *T. rathkii* in significantly lower number than traps "f" to "j". The abundance of this species increased gradually from trap "e" toward trap "j". Traps "a" to "d" did not catch any gravid females and only one male individual of this species. Few specimens of non-gravid females of *T. rathkii* occurred in traps "a" to "e". Traps "i" and "j" caught *T. ratzeburgi* in significantly lower number than traps "a" to "h" (Fig. 3). The amount of gravid females of this species was higher in traps "a" to "e" than in traps "f" to "j".

According to these results two conclusions can be drawn: (1) *A. vulgare* and *P. collicola* do not show preference to any plant associations, because the distribution of these species

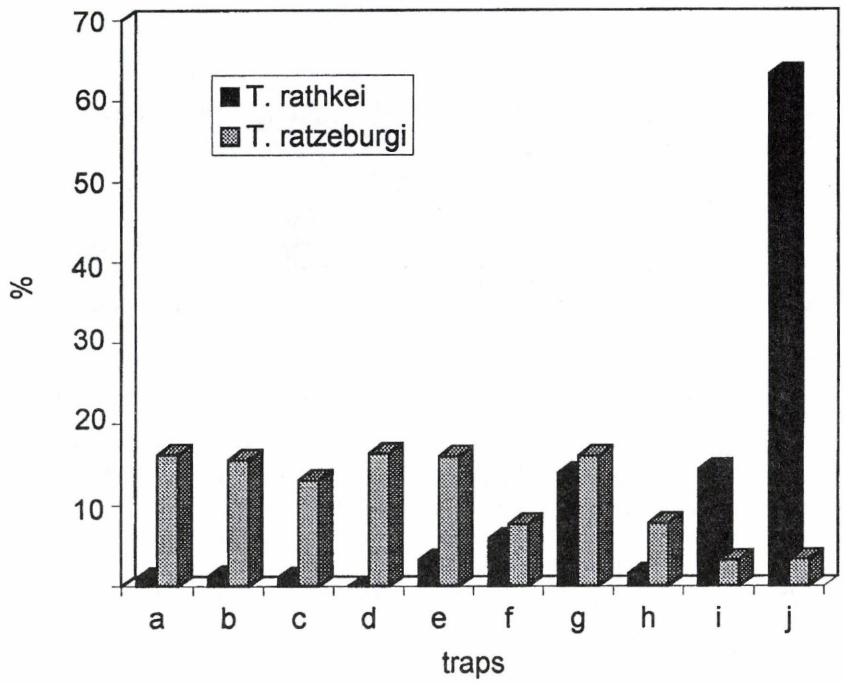

Fig. 3: Spatial distribution of *T. rathkii* and *T. ratzeburgi* (traps "a"-"e":oak forest; "f"-"g": ecotone zone; "i"-"h": ruderal vegetation)

was equal along the transect; (2) *T. rathkii* prefers the ruderal vegetation and avoids the inside of the oak forest, and *T. ratzeburgi* shows an opposite preference. The difference is particularly conspicuous in the case of gravid females. The first conclusion is in harmony with the results of earlier studies, according to which *A. vulgare* and *P. collicola* have wide tolerance of habitat. This ubiquituos character is indicated by the fact that the change of vegetation does not affect their spatial distribution. *A. vulgare* lives in wet deciduous forests (Beyer 1964), on moving dunes (Davis & Sutton 1977) and on grasslands (Hassal & Dangerfield 1989). In Hungary this species is abundant in the relic oak forests (Szlávecz 1991), but occurs in open, dry meadow habitats as well (Szlávecz 1995). Hornung (1992) found it in humid depressions of the sandy areas of the Great Hungarian Plain. *P. collicola* may occur in very different habitats, too. Loksa (1966) collected it on the south-facing, dry slopes of the Hungarian Mountain Range. Szlávecz (1991) found this species in the open, saline places and oak forests of the Hortobágy National Park, in oak-elm-ash gallery forests and in sandy pedunculate oak-silver-lime forests of Bátorliget Natural Reserves. The species is evenly distributed among the habitats (Szlávecz 1995). The species occurred in all studied vegetation types in the Pilis Biosphere Reserve, as well (Szlávecz 1988). The interpretation of the second conclusion is difficult, because there is scarce information about the habitat preference of *T. ratzeburgi*. This species likes dry woodlands (Gruner 1966). According to our hypothesis the preferred habitat perfectly covers its niche, so its competi-

tive ability is the greatest here. Toward the edge the quality of its habitat changes unfavourably, therefore its abundance and competitive ability decreases. *T. rathkii* is definitely an euryoec species. It often occurs in extreme dry or wet places, ruderal vegetation and artificial habitats (Gruner 1966). It was found in woodlands, open habitats and in transition areas between forest and meadow (Szlávecz 1991). This is the most abundant isopod species of the wetland forests along the Dráva River (Farkas 1995, 1998b). *T. rathkii* cannot compete with *T. ratzeburgi* inside the forest. The decrease of the abundance of *T. ratzeburgi* toward the edge corresponds with the increase in the abundance of *T. rathkii. T. rathkii* gradually takes over the function of *T. ratzeburgi* in the foodweb.

3. Seasonal changes in surface activity

There were two peaks in the activity of *A. vulgare*: in June and at the end of October. It decreased during July to 0.1 and after the autumn peak fell down again to 0.02 specimens/trap/day (Fig. 4). There are similar data about the activity of *A. vulgare* in many papers (Ilosvay 1983, Farkas 1995, 1998a, Szlávecz 1995, Hornung 1991). The activity of *A. vulgare* increases during May and June, and remains high till September-October. According to Hornung's (1991) opinion the dry and warm summer causes a contraction in the favourable habitat patches that can also result in an intensive migration, increasing surface activity. The surface activity of *P. collicola* was about 0.1-0.2 specimens/trap/day during summer. It increased at the end of September and reached its peak at 0.7 specimens/trap/day. It decreased gradually to 0.1 specimens/trap/day in the second half of autumn (Fig. 4). Very similar results were discovered at Bakháza (Farkas 1998a). Probably *P. collicola* has only one active period in early autumn. Comparing the results of the present and an earlier

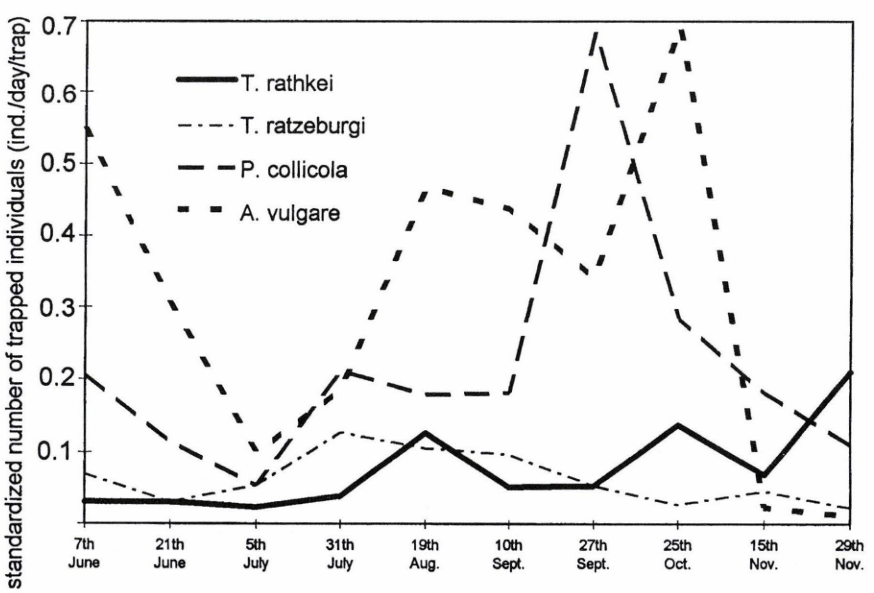

Fig. 4. Seasonal changes in surface activity

(Farkas 1998b) study, two conclusions can be drawn in the case of *T. rathkii*. (1) The number of trapped animals was 35 times lower in Péterhida than in Gordisa. This phenomenon is in accordance with the opinion mentioned above, stating that neither the dry oak forest nor the surrounding ruderal vegetation are adequate habitats for *T. rathkii*. (2) The surface activity strongly increased two times in the wet lowland forest of Gordisa. Such activity peaks were not detectable in the dry oak forest where the activity was almost uniform during the examined period. However, the highest value of activity was found at the last sampling (29th November; 0.2 specimens/trap/day). The surface activity of *T. ratzeburgi* did not show great seasonal changes (Fig. 4). Only a weak increasing tendency was detectable during July and August, but there was no particular peak. The standardized number of trapped specimens was low and fluctuated between 0.02-0.2 specimens/trap/day. The activity of *T. ratzeburgi* was low at Farkasgyepű, too, during the first 7 months of the year, and the number of trapped individuals increased only in August and September (Ilosvay 1983). Both of these studies showed one relatively more active period at the end of summer.

4. Seasonal changes in sex ratio

The sex ratio was strongly female biased in all of the species. *T. ratzeburgi* was the only species where the number of females decreased to less than 50% (samples N°1 and 8 N°). The average percent of *P. collicola* females was the highest: 90%. The amount of female individuals of *A. vulgare* was on average 85%. The maximum amount of female *T. rathkii* specimens occurred in summer. It started to decrease gradually after July but did not go below 60% (Fig. 5.).

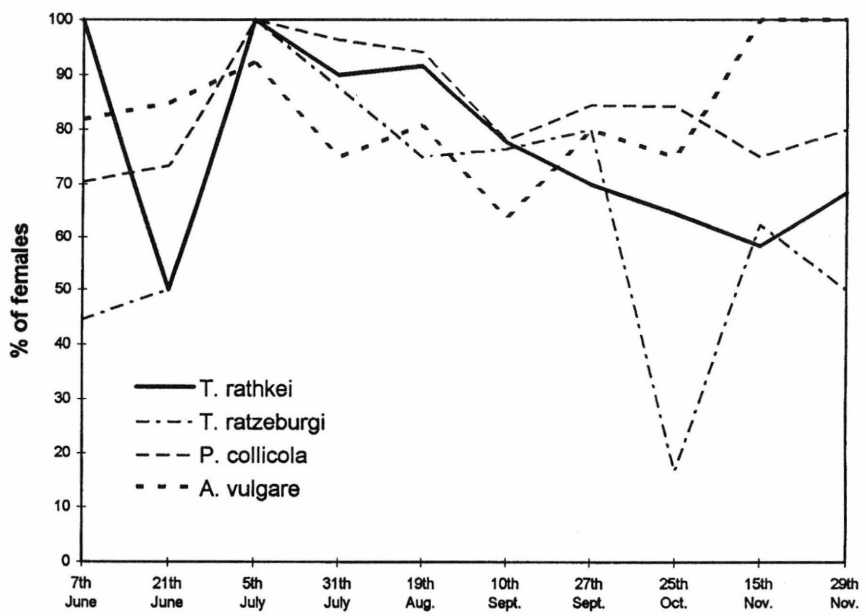

Fig. 5. Seasonal changes in female individuals

5. Seasonal changes in the number of gravid females

The maximum percent of gravid *A. vulgare* specimens was only 30% (Fig. 6) and this peak occured in sample Nº4 (31st July). Hornung (1991) found a similar pattern. The reproductive period of this species ended early: the last gravids were found in sample Nº6 (10th September). The reproductive curve of *A. vulgare* differed from that of the other three species. The slope of the curve was flatter and the peak was lower. The reproductive characteristics of *P. collicola* and *T. ratzeburgi* were similar (Fig. 6.). The most gravid females

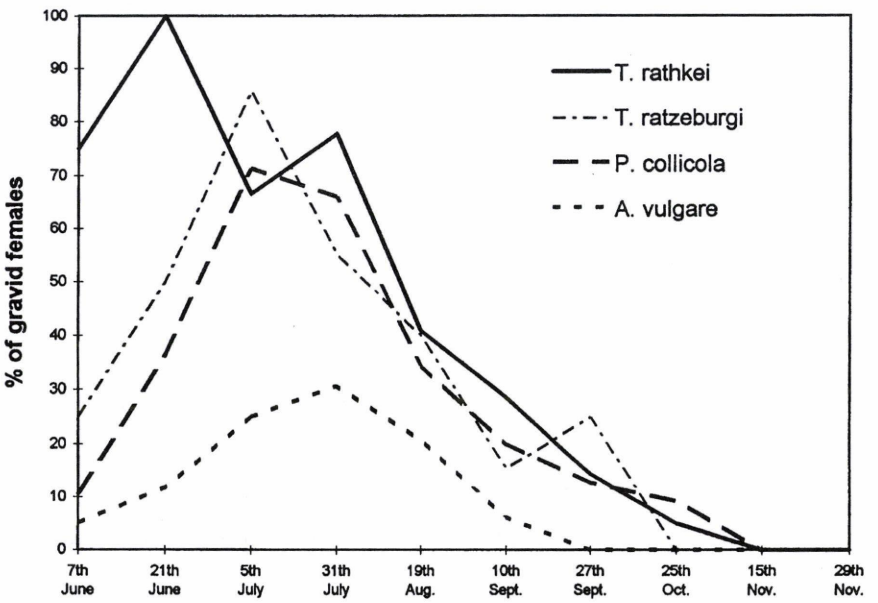

Fig. 6. Seasonal distribution of gravid females

of both species were found in sample Nº3 (5th July). After this peak the amount of gravid females steadily decreased to 0%. To my knowledge no data are available in t he literature concerning the reproduction of *P. collicola*. According to Gruner (1966) *T. ratzeburgi* has only one marsupial period that occurs in summer. The maximum of gravid females of *T. rathkii* was detected early in the season: 100% of females were gravid in sample Nº2 (21th June). After the end of July the ratio started to decrease uniformly (Fig. 6). There were no gravid *T. rathkii* females in November. Farkas (1998b) found that the maximum percent of gravid females was 18% in the wetland forest. In the dry oak forest at Péterhida this value was 100%. Generally, the amount of gravids was 6 times higher in the oak forest than that of the wetland forest for the same period. This phenomenon suggests that in an inadequate habitat an increasing number of gravid females might occur.

Acknowledgments

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